Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

Declaration of Paul R. Milgrom

1. My name is Paul R. Milgrom. I am the Shirley and Leonard Ely, Jr. Professor of Humanities and Sciences and Professor of Economics at Stanford University in Stanford, California, 94305.

2. I received an A.B. degree in Mathematics from the University of Michigan and an M.S. in Statistics and a Ph.D. in Business from Stanford University. My academic specialty is microeconomic theory, with an emphasis on how institutions affect economic performance. From 1990-1994, I was coeditor of the largest circulation academic journal in the economics profession — the *American Economic Review*. I have also served on the editorial boards of several other economics journals. I am the author of more than sixty books and articles and have been the recipient of numerous awards and honors, including Fellowships in the American Academy of Arts and Sciences and the Econometric Society. I have also received Fellowship grants from the John Simon Guggenheim Foundation, the Center for Advanced Study in the Behavioral Sciences, and the Center for Advanced Studies in Jerusalem.

3. I have devoted considerable time and attention to telecommunications issues, especially ones concerning PCS. Since November of 1993, I have filed eight affidavits or statements with the Commission regarding PCS-related matters, including two that were coauthored with my colleague, Stanford Professor Robert Wilson. I acted as an adviser to Pacific Telesis Mobile Systems (PTMS) during the recently completed auction #4 of broadband PCS licenses. In 1994, I filed an affidavit in connection with the motion to terminate the MFJ. In 1984, when the MFJ precipitated a restructuring of certain contracts between AT&T and the Southern New England

Telephone Company (SNET), I advised SNET about the renegotiation of its contracts.

4. My other experience with regulatory matters is diverse. It includes testimony given to the Federal Energy Regulatory Commission concerning pricing on the Trans-Alaska pipeline, testimony at trial concerning the economics of the insurance contracting, and written testimony concerning environmental regulation filed with the National Oceanographic and Atmospheric Administration (NOAA).

5. I have been asked by Pacific Telesis Mobile Systems to comment on the likely costs of any significant delay in issuing PCS licenses from auction #4, in which PBMS was the high bidder for the B-band licenses covering Los Angeles and San Francisco. This is to include the costs suffered by the bidders on account of the delays, as well as losses in consumer surplus that might result.

Summary

6. In summary, my opinion is that the losses associated with any delay in issuing the licenses would be very large. Losses in consumer surplus resulting from a delay in the introduction of PCS services amount to at least $650 million per year of delay, or nearly $55 million per month, even under the most conservative scenarios. More realistic scenarios can entail losses more than four times as high: $2.7 billion per year or $225 million per month. Losses to the potential A and B licensees are harder to estimate, especially since some of the bidders would also benefit in their roles as cellular service providers. Focusing solely on the lost profits from PCS services, ignoring the partially offsetting gains enjoyed by cellular providers, reasonable estimates lead to numbers as high as $770 million per year, or $64 million per month. Taking a different approach to the problem by valuing the total change in consumer plus producer surplus, including the large reduction in profits of the cellular providers resulting from increased competition, leads to estimated costs of delay of $567 million per year, or more than $47 million per month.

Details of Computations

7. From the perspective of a winning bidder like Pacific Telesis, which has no cellular interests, one cost of a delay in issuing PCS licenses is the delay in the onset of cash flows, which results in a reduction in the discounted value of those cash flows. This cost can be calculated by assuming that all the expenditures and revenues from the business are delayed for some period of time. For the companies that bid on the 99 broadband PCS licenses and tailored their business plans around them, the $7 billion bid for the licenses represents a lower bound for their estimated value of entering the PCS business. The real discount rates used by investors in evaluating the risky investments in PCS appear to be in the range of 6% to 10%.[1] Consequently, even if the companies anticipated that their investments would return no more than the cost of capital, the annual real interest costs of the delay in the profit stream would be in the range of $460-770 million.[2] This cost will not be born entirely by the bidders: part of it will be born by the Treasury in the form of delayed payments for PCS licenses.

8. The preceding estimate assumes conservatively that the highest bidders had bid to their limits to acquire their licenses. Such is hardly ever the case in an auction. In auction #4, the strong correlation between the level of competition on a license and the license price per unit of population indicates that the more lightly contested licenses incorporated substantial profits for the highest bidders, and the other licenses may have included such profits as well. The economic cost of delay includes a return on the entire present value of future cash flows, which would result in a larger estimate than the one just given.

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[1]CS First Boston's report *PCS: A Critical Piece of the Communications Puzzle* (February 21, 1995) uses a cost of capital of 13% for its discounted cash flow analysis of PCS licenses. Donaldson, Lufkin & Jenrette's report *The Wireless Communications Industry* (Winter, 1994-1995) uses costs of capital from 12% to 15% for its discounted cash flows.

[2]For this calculation, I assume that the companies have already raised and committed the funds for the licenses and invest them temporarily during the delay. I further assume that investors do not regard the delay in issuing licenses as reducing the overall risk of the investment in a way that reduces the applicable cost of capital.

9. A second cost of the delay arises from the fact that potential licensees have already begun to hire staff, lease cell sites, and order equipment in the expectation that the licenses would be issued and service begun. To the extent that delaying the issuance of the A and B licenses has the effect of delaying service, revenues from the PCS service would be delayed, but some of the expenditures would not be. Data on these expenditures, including a division of them between current expenses and investments whose value would be only partially lost, are not available to me. However, Pacific Telesis Mobile Service representatives have reported to me that PTMS's current expenditures on the wireless business are approximately $8 million per month, plus capital costs. If operations of similar magnitude across the nation are idled by this delay, the associated costs would be very substantial.

10. A third source of costs to the PCS providers is the likelihood that they will lose market share to existing cellular telephone licensees. This is similar to the effect that the petitioners claim would result in injury in the event that the auction of the C block licenses is delayed.[3] The loss of PCS profits resulting from delaying the issuance of the A and B licenses would be greater than the benefits enjoyed by the minority licensees, because PCS providers as a group would lose market share to cellular providers on account of such a delay.

11. The largest cost of any delay in instituting PCS services would be borne by consumers in the wireless industry, for whom access to PCS services would be delayed and who would pay higher prices for cellular services due to the absence of PCS competition. Estimates of the loss of consumer surplus from delayed entry depends on assumptions about the nature of competition and the effectiveness of regulation in the industry, as well as on forecasts of demand. However, even the most rough-and-ready estimates show that the cost is very large. Currently, cellular service is provided by what is essentially a duopoly. The introduction of two new competitors into the wireless services market that led to price reductions of just 10% with no consequent expansion in demand would still increase consumer surplus by an amount equal

[3]On page 17, they argue: "By getting to market first the A and B licensees will be able to develop a substantial customer based before the C block licenses are issued."

to 10% of the existing industry revenues. As of the summer of 1994, annualized industry revenues amounted to approximately $6.5 billion,[4] leading to an estimated gain for consumers of $650 million per year.

12. The preceding estimate, however, is probably too low. Because even conservative assumptions about demand can lead to very large estimates of the loss of consumer surplus from delayed entry, I have constructed my estimates using conservative assumptions about demand. First, despite the persistent growth of demand recently experienced and forecast by almost every pundit, I assume that the scale of the wireless market is fixed at the level attained in the summer of 1994. Second, despite estimates which show that demand for wireless services has tended to be quite inelastic, I assume that wireless service demand has unitary elasticity, which is the average elasticity for all products in the economy.[5] Third, in order to focus on the beneficial effects of competition for consumers, I assume that there is an absence of regulation that either raises or depresses prices. Finally, I assume that the parties have equal costs and engage in Cournot competition, which is a moderate and widely used specification of the intensity of competition among wireless providers.

13. With these assumptions, the eventual effect on consumer surplus of increasing the number of competitors in a market from two to four would be a fifty percent (50%) increase in the volume of wireless calling, a thirty three percent (33%) reduction in the prices of wireless services, and an increase in consumer surplus of approximately $2.7 billion per year. Delaying the day when the new entry first occurs amounts to delaying the time at which consumers first begin enjoying this enormous benefit.

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[4]*The Wireless Communications Industry*, Donaldson, Lufkin & Jenrette, Winter 1994-1995.

[5]In an affidavit to the Commission dated September 14, 1994, Professor Jerry Hausman estimated the price-elasticity of demand to be -0.402 with a standard error of .155. As the customer base for wireless services expands, demand may become more elastic. Since more elastic demand leads to lower estimates of the additional consumer surplus from increased competition, I have used such an estimate here.

14. The identified benefit would be enjoyed only after a delay of several years during which the new PCS providers captured significant market share and the existing providers responded to the new competition by reducing their prices. Depending on one's estimate of the rate of market penetration by the new services, some level of discounting may be appropriate. In the past decade, however, the growth rate of the demand for wireless services has far outstripped any estimate of consumer discount rates, and the reports cited earlier forecast that such growth will continue. Allowing for both growth and discounting could lead to an even larger estimate of the gain of consumer surplus.

15. A final calculation involves the total gain in consumer plus producer surplus resulting from increased competition. This consists of the increase in consumer surplus, plus the profits of the PCS providers, minus the very substantial reduction in profits of the cellular service providers–what economists call the "Harberger triangle." The computation has been done using the same Cournot model described above, in which the number of competitors is increased from two to four. The total gain in producer plus consumer surplus from the increase in competition is then $567 million per year, or more than $47 million per month.

16. Point estimates of the gain in consumer surplus resulting from increased competition at an earlier date are necessarily uncertain. Nevertheless, as the two estimates provided above indicate, this market is so large and so concentrated that any reasonable estimate will forecast huge benefits for consumers and for the whole economy from the introduction of competing PCS services. Delays in issuing the licenses are costly because they postpone the day when those benefits can be enjoyed.

Pursuant to 28 U.S.C. § 1746, I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct. Executed on May 1_, 1995.

Paul R. Milgrom

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CERTIFICATE OF SERVICE

I, Kathleen Joseph, hereby certify that on this 10th day of August 1995, copies of the foregoing Opposition to the Application for Review of The National Association of Black Owned Broadcasters, Percy E. Sutton, and the National Association for the Advancement of Colored People Washington Bureau, attachments, and Certificate of Service were caused to be served by hand delivery or first-class mail, postage prepaid, upon the parties listed below.

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